PATENT ABSTRACTS OF JAPAN

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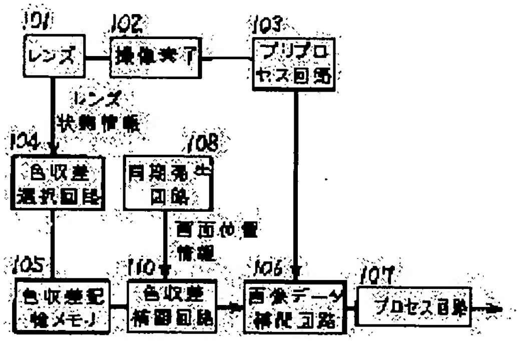
(54) CHROMATIC ABERRATION CORRECTING CIRCUIT AND IMAGE PICKUP DEVICE WITH CHROMATIC ABERRATION CORRECTING FUNCTION

(57)Abstract:

PURPOSE: To correct a chromatic aberration generated by a lens through signal processing.

CONSTITUTION: This device is equipped with a chromatic aberration selecting circuit 104 which takes chromatic aberration information corresponding to a lens state out of a chromatic aberration storage memory 105, a chromatic aberration interpolating circuit 110 which interpolates chromatic aberrations corresponding to respective parts of a screen with the selected chromatic aberration information and screen position information, and an image data interpolating circuit 106 which interpolates original image data having the chromatic aberrations compensated according to the lens state outputted by the chromatic aberration interpolating circuit 110 and chromatic aberration information corresponding to the respective parts of the screen. Then the chromatic aberration interpolating circuit 110 interpolates chromatic aberration information on each pixel on the basis of chromatic aberration information at a specific position outputted from the chromatic aberration storage memory 105 and outputs the resulting information, and an image data interpolating circuit 106 interpolates the image data on the basis of the chromatic aberration information; and the interpolated image data are used



to greatly reduce the capacity of the chromatic aberration storage memory 105 and suppress a phenomenon of color slurring, a decrease in resolution, etc., that appears greatly, specially, at the peripheral part of the screen, thereby obtaining an image of higher picture quality.

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[Date of final disposal for application]

[Patent number]

[Date of registration]

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DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[Industrial Application] this invention relates the chromatic aberration in the lens used for image pck-up equipment by signal processing to an amendment chromatic-aberration amendment circuit and image pck-up equipment with a chromatic-aberration amendment function.
[0002]
[Description of the Prior Art] With the image pick-up tube camera, registration adjustment and strain adjustment are conventionally performed by laying correction voltage on top of the deflecting voltage of an electron beam. although these adjustments are originally the meanses of an amendment sake about the error which the image pick-up tube itself has -- a distortion (distortion) peculiar to a lens as a result, and the chromatic aberration of magnification -- it can contain -- an amendment -- things were possible
[0003] However, in the CCD camera, since CCD which is an image pck-up element fixed through prism and the two-dimensional position of a photodiode was fixed, amendment of chromatic aberration was a difficult problem. At the former, own chromatic aberration of a lens was reduced with devising the glass quality of the material of a lens etc.
[0004]
[Problem(s) to be Solved by the Invention] However, there are the following troubles by the above-mentioned conventional method. That is, in order to devise own material of a lens etc., it had the trouble that the lens itself will become very expensive.
[0005] Moreover, with the cheap lens, it had the trouble of causing phenomena, such as gap of a color, bleeding of a color, and a fall of resolution, in the screen periphery for the chromatic aberration produced since a refractive index changes with wavelength.
[0006] Moreover, it had the trouble that a very big capacity was required as memory for holding chromatic-aberration information.
[0007] the chromatic aberration which this invention solves the above-mentioned conventional trouble, and is generated with a lens -- signal processing -- an amendment -- things -- especially, the phenomenon of the color gap, color bleeding, and the resolution fall which were appearing notably by the screen periphery is suppressed, and it aims at offering the chromatic-aberration amendment circuit and the image pck-up equipment with a chromatic-aberration amendment function which can obtain a high definition image
[0008]
[Means for Solving the Problem] In order to attain the above-mentioned purpose, this invention is a chromatic-aberration amendment circuit characterized by to have the memory holding a lens state and the chromatic-aberration information corresponding to the screen position, the chromatic-aberration selection circuitry which chooses a lens state and the chromatic-aberration information corresponding to the screen position from memory, and the image data interpolation circuit which interpolates the image data which amended chromatic aberration with a criteria color using the selected chromatic-aberration information.

[0009] Moreover, the memory holding the chromatic-aberration information this invention indicates the relation between a lens state and the distance from a screen center position, and chromatic aberration to be, The chromatic-aberration selection circuitry which chooses the chromatic-aberration information corresponding to the lens state from memory, The chromatic-aberration judging circuit which judges the chromatic aberration in each part of a screen by the selected chromatic-aberration information and selected screen positional information, It has the image data interpolation circuit which interpolates the original image data which amended chromatic aberration from the lens state which is the output of a chromatic-aberration judging circuit, and the chromatic-aberration information corresponding to each part of a screen. It is the chromatic-aberration amendment circuit characterized by asking for the chromatic aberration in each pixel using the chromatic-aberration information which computed the distance from the screen center position in each part of a screen in the chromatic-aberration judging circuit, and was outputted from the computed distance and chromatic-aberration storage memory.
[0010] Moreover, the memory holding the chromatic-aberration information corresponding to the lens state and the specific screen position in this invention, The chromatic-aberration selection circuitry which chooses the chromatic-aberration information corresponding to the lens state from memory, The chromatic-aberration interpolation circuit which interpolates the chromatic aberration in each part of a screen by the selected chromatic-aberration information and selected screen positional information, It has the image data interpolation circuit which interpolates the original data which amended chromatic aberration from the lens state which is the output of a chromatic-aberration interpolation circuit, and the chromatic-aberration information corresponding to each part of a screen. It is the chromatic-aberration amendment circuit characterized by interpolating and outputting the chromatic aberration in each pixel by the chromatic-aberration interpolation circuit based on the chromatic-aberration information on the specific position outputted from chromatic-aberration storage memory.
[0011]
[Function] By the above-mentioned composition, by obtaining with interpolation the image data which amended chromatic aberration based on the chromatic-aberration information corresponding to the lens state and the screen position, this invention can suppress phenomena, such as color gap which appears notably especially by the periphery of a screen, color bleeding, and a resolution fall, and can obtain a high definition image.
[0012] moreover, by the above-mentioned composition, by applying the chromatic-aberration information which shows the relation between the distance from a screen center position, and chromatic aberration in all the directions of [on a screen], the memory space holding chromatic-aberration information can be boiled markedly, and this invention can lessen it in a chromatic-aberration judging circuit
[0013] moreover, with interpolating and outputting the chromatic-aberration information in each pixel from the chromatic-aberration information corresponding to the specific screen position by the chromatic-aberration interpolation circuit by the above-mentioned composition, the memory space holding chromatic-aberration information can be boiled markedly, and this invention can lessen it
[0014]
[Example] Drawing 1 is the block diagram showing the composition of the chromatic-aberration amendment circuit in the 1st example of this invention. The lens equipped with the function in which 101 outputs situations, such as a zoom scale factor of a lens, a focus, and drawing, in drawing 1 , The image pck-up element which 102 picturizes the incidence image from a lens 101, and outputs the signal of R, G, and B, R and G from which 103 was obtained from the image pck-up element 102, the pulley process circuit which carries out pretreatments, such as amplification, to B signal, 104 from lens status information, such as a zoom scale factor, a focus, and drawing, and the screen positional information of each pixel Each pixel corresponding to the lens state and the chromatic-aberration information corresponding to each color are chosen. The chromatic-aberration selection circuitry which generates the control signal for outputting from the chromatic-aberration storage memory 105, and 105 are gap width of face (when a criteria color is set to G) generated with the chromatic aberration to each pixel corresponding to the lens state, and the criteria color in each color. The chromatic-aberration storage

memory holding the information about the position gap width of face of the position as for which G is carrying out image formation, and the position as for which R is carrying out image formation, 106 follows the gap width-of-face information over the criteria color generated with the chromatic aberration which is chromatic-aberration storage memory 105 output. The image data interpolation circuit which interpolates and outputs the image data (signal in case there is no gap by chromatic aberration) in the position to which it shifted from the output (signal of the position which shifted with chromatic aberration) of the pulley process circuit 103, and a part for width of face was returned, The process circuit where 107 computes a luminance signal etc. from R and G by which amendment of chromatic aberration was made by the image data interpolation circuit 106, and B signal, and 108 are synchronous generating circuits which output the screen positional information which shows which portion on a screen the image data under processing is now.

[0015] About the chromatic-aberration amendment circuit of this example constituted as mentioned above, the operation is explained below.

[0016] First, through a lens 101, light carries out incidence, is changed into the signal of R, G, and B by the image pck-up element 102, pretreats amplification etc. in the pulley process circuit 103, and is outputted to the image data interpolation circuit 106.

[0017] Moreover, it is based on one in R, G, and B (for example, G signal) in ~~the chromatic-aberration storage memory 1~~05. The gap width-of-face information by the chromatic aberration peculiar to a lens 101 to other colors (R, B) Each lens state, Correspond for every pixel, it is set up beforehand, and a lens 101 lens status information, such as for example, a zoom position which shows a lens state The synchronous generating circuit 108 outputs the information on the screen position of the image data under processing to the chromatic-aberration selection circuitry 104 now, and controls by the chromatic-aberration selection circuitry 104 to output a lens state and the chromatic-aberration information corresponding to the pixel position from the chromatic-aberration storage memory 105. Using the gap width-of-face information by the chromatic aberration outputted from the chromatic-aberration storage memory 105, in the image data interpolation circuit 106 From the image data before the chromatic-aberration amendment which is the output of the pulley process circuit 103 (signal of the position which shifted with chromatic aberration) The image data (signal in case there is no gap by chromatic aberration) in the position to which a part for gap width of face was returned is interpolated, it outputs to the process circuit 107 as image data after amendment, and video signals, such as a luminance signal, are obtained in the process circuit 107 using R after amendment, G, and B signal.

[0018] As mentioned above, by computing the image data which shifted the gap width-of-face part phase in each pixel by the image data interpolation circuit 106 using the gap width-of-face information by the lens state and the chromatic aberration peculiar to a lens corresponding to the pixel position, and obtaining video signals, such as a luminance signal, using the interpolated image data, phenomena, such as color gap which appears notably especially by the periphery of a screen, color bleeding, and a resolution fall, can be suppressed, and a high definition image can be obtained.

[0019] The 2nd example of this invention is explained below, referring to a drawing. Drawing 2 shows the block diagram of the chromatic-aberration amendment circuit in the 2nd example of this invention. The lens equipped with the function in which 101 outputs situations, such as a zoom scale factor of a lens, a focus, and drawing, in drawing 2 , The image pck-up element which 102 picturizes the incidence image from a lens 101, and outputs the signal of R, G, and B, R and G from which 103 was obtained from the image pck-up element 102, the pulley process circuit which carries out pretreatments, such as amplification, to B signal, 104 chooses the chromatic-aberration information which shows the relation of the distance from a screen center position and chromatic aberration corresponding to the lens state of each color from lens status information, such as a zoom scale factor, a focus, and drawing. The chromatic-aberration selection circuitry which generates the control signal for outputting from the chromatic-aberration storage memory 105, The chromatic-aberration storage memory in which 105 holds the information which shows the relation between the distance from the screen center position corresponding to the lens state in each color, and the gap width of face to a criteria color, 109 from the output from the information which shows the screen position of each pixel, and the chromatic-aberration storage memory 105 Each pixel, The chromatic-aberration judging circuit which determines and outputs the chromatic-aberration information corresponding to each color, and 106 follow the gap width-of-face information which is a chromatic-aberration judging circuit output. The image data interpolation circuit which interpolates and outputs the image data in the position which shifted from the output of the pulley process circuit 103, and shifted the width-of-face part phase, The process circuit where 107 computes a luminance signal etc. from R and G by which amendment of chromatic aberration was made by the image data interpolation circuit 106, and B signal, and 108 are synchronous generating circuits which output the screen positional information which shows which portion on a screen the image data under processing is now.

[0020] The material-difference point with the 1st example is a point that the data information and the chromatic-aberration judging circuit which are held at chromatic-aberration storage memory are introduced.

[0021] According to the 2nd example of this invention, the capacity of chromatic-aberration storage memory is sharply reducible. This is explained below.

[0022] The following modelings are made in the 2nd example of this invention. That is, the gap width of face by the chromatic aberration of a lens is modeling that it is what does not call at a direction but is dependent only on distance. Therefore, the data of the chromatic aberration which should be held at the chromatic-aberration storage memory 105 are data about the gap width of face by the distance and the chromatic aberration for amendment from a screen center of each lens state (for example, situations, such as a looking-far (call) side in zoom, and a wide angle (wide) side) of every.

[0023] In the 1st example of this invention, to being attached to all the pixels on a screen for every lens state, and having to hold the gap width of face in memory, what is necessary is just coming to hold the gap width of face for an abbreviation half line, and it becomes reducible [large memory space] in the 2nd example of this invention.

[0024] Furthermore, since it is necessary to output the gap width of face by chromatic aberration to all the pixels on a screen, in the chromatic-aberration judging circuit 109, the distance based on screens is computed from the screen position of each pixel, and it has composition which judges and outputs the gap width of face in each pixel from the data of the gap width of face beforehand set as the computed distance and the chromatic-aberration storage memory 105.

[0025] About the chromatic-aberration amendment circuit of this example constituted as mentioned above, the operation is explained below.

[0026] First, through a lens 101, light carries out incidence, is changed into the signal of R, G, and B by the image pck-up element 102, pretreats amplification etc. in the pulley process circuit 103, and is outputted to the image data interpolation circuit 106.

[0027] Moreover, a lens controls to output the chromatic-aberration data in which the gap width of face by the distance and chromatic aberration from the screen center corresponding to [output lens status information, such as a zoom position, to the chromatic-aberration selection circuitry 104, for example, and] the lens state at the chromatic-aberration selection circuitry 104 in which a lens state is shown is shown from the chromatic-aberration storage memory 105 to the chromatic-aberration judging circuit 109.

[0028] The gap width-of-face information by other distance and chromatic aberration from a screen center peculiar to a lens 101 to a color (R, B) is beforehand set to the chromatic-aberration storage memory 105 corresponding to each lens state on the basis of one in R, G, and B (for example, G signal).

[0029] Furthermore, in the chromatic-aberration judging circuit 109, the distance based on screens is computed from the screen position of each pixel, and the gap width of face in each pixel is judged and outputted from the data of the gap width of face beforehand set as the computed distance and the chromatic-aberration storage memory 105. Using the gap width-of-face information by the chromatic aberration outputted from the chromatic-aberration judging circuit 109, in the image data interpolation circuit 106, the image data in the position which shifted the gap width-of-face part phase is interpolated, it outputs to the process circuit 107 as image data after amendment, and video signals, such as a luminance signal, are obtained in the process circuit 107 using R after amendment, G, and B signal from the image data before the chromatic-aberration amendment which is the output of the pulley process circuit 103.

[0030] As mentioned above, curtailment of large memory space can be performed by having introduced the data information and the chromatic-aberration judging circuit which are held at chromatic-aberration storage memory.

[0031] The 3rd example of this invention is explained below, referring to a drawing. Drawing 3 shows the block diagram of the chromatic-aberration amendment circuit in the 3rd example of this invention.

[0032] The lens equipped with the function in which 101 outputs situations, such as a zoom scale factor of a lens, a focus, and drawing, in drawing 3 , The image pck-up element which 102 picturizes the incidence image from a lens 101, and outputs the signal of R, G, and B, R and G from which 103 was obtained from the image pck-up element 102, the pulley process circuit which carries out pretreatments, such as amplification, to B signal, The specific screen position where 104 agreed in the lens state from lens status information, such as a zoom scale factor, a focus, and drawing The chromatic-aberration selection circuitry which generates the control signal for choosing the chromatic-aberration information corresponding to each color, and outputting from the chromatic-aberration storage memory 105, The chromatic-aberration storage memory in which 105 holds the information about the specific screen position corresponding to the lens state, and the gap width of face in each color, The chromatic-aberration interpolation circuit which interpolates and outputs the gap width of face in a required pixel position from the information about the gap width of face in the screen position of specification [110], The image data interpolation circuit which interpolates and outputs the image data in the position which 106 shifted from the output of the pulley process circuit 103 according to the information on the gap width of face which is a chromatic-aberration interpolation circuit output, and shifted the width-of-face part phase, The process circuit where 107 computes a luminance signal etc. from R and G by which amendment of chromatic aberration was made by the image data interpolation circuit 106, and B signal, and 108 are synchronous generating circuits which output the screen positional information which shows which portion on a screen the image data under processing is now.

[0033] The gap width of face by the chromatic aberration to the pixel to which the gap width-of-face information by the chromatic aberration to all pixels is not held, only the gap width-of-face information on a specific position is set as chromatic-aberration storage memory, and the material-difference point with the 1st example is not set is a point acquired by carrying out interpolation calculation using a certain fixed algorithm by the chromatic-aberration interpolation circuit.

[0034] According to the 3rd example of this invention, supposing it sets beforehand the gap width-of-face information in every other one as memory horizontally, for example, it will be good in the half of the 1st memory space of this invention. Moreover, since there is little gap by the screen center section, in the screen center section, it shifts, width of face is interpolated by zero, and the gap width of face to all pixels is obtained by mainly setting the gap width of face of a screen periphery as memory, for example.

[0035] Since it is not necessary to set beforehand the gap width-of-face information by the chromatic aberration to all pixels as memory above according to the 3rd example of this invention, the capacity of chromatic-aberration storage memory is sharply reducible.

[0036] Moreover, about operation of each circuit, since it is the same as that of the 1st and 2 example, explanation is omitted.

[0037] Moreover, although reference was not made at all about the composition of an image data interpolation circuit in the above explanation Using the gap width-of-face information by the chromatic aberration outputted from chromatic-aberration storage memory, the chromatic-aberration judging circuit, or the chromatic-aberration interpolation circuit Interpolate the image data in the position which shifted the gap width-of-face part phase from the image data before the chromatic-aberration amendment which is the output of a pulley process circuit, and if it is the image data interpolation circuit to output, although it will be a linear interpolation circuit Although it is a very exact interpolation circuit, no matter it may be what interpolation circuit, it is in Ming that this invention can be constituted.

[0038] Moreover, even if it is in Ming that this invention can be constituted from the above explanation using the color gap width-of-face information on the specific position set as chromatic-aberration storage memory if the color gap width-of-face information on all pixels can be outputted although reference was not made at all about the composition of a chromatic-aberration interpolation circuit, it is a mere replacement circuit and it is an alignment interpolation circuit, you may be a gap width-of-face selection circuitry by field judgment.

[0039]

[Effect of the Invention] As explained above, according to this invention, by obtaining with interpolation the image data which amended chromatic aberration based on the chromatic-aberration information corresponding to the lens state and the screen position, phenomena, such as color gap which appears notably especially by the periphery of a screen, color bleeding, and a resolution fall, can be suppressed, and a high definition image can be obtained.

[0040] moreover, as explained above, according to this invention, by applying the chromatic-aberration information which shows the relation between the distance from a screen center position, and chromatic aberration in all the directions of [on a screen], the memory space holding chromatic-aberration information can be boiled markedly, and can be lessened in a chromatic-aberration judging circuit

[0041] moreover, as explained above, according to this invention, with interpolating and outputting the chromatic-aberration information in each pixel from the chromatic-aberration information corresponding to the specific screen position by the chromatic-aberration interpolation circuit, the memory space holding chromatic-aberration information can be boiled markedly, and can be lessened

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DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]
[Drawing 1] The block diagram showing the composition of the chromatic-aberration interpolation circuit in the 1st example of this invention
[Drawing 2] The block diagram showing the composition of the chromatic-aberration interpolation circuit in the 2nd example of this invention
[Drawing 3] The block diagram showing the composition of the chromatic-aberration interpolation circuit in the 3rd example of this invention
[Description of Notations]

101	Lens
102	Image Pck-up Element
103	Pulley Process Circuit
104	Chromatic-Aberration Selection Circuitry
105	Chromatic-Aberration Storage Memory
106	Image Data Interpolation Circuit
107	Process Circuit
108	Synchronous Generating Circuit
109	Chromatic-Aberration Judging Circuit
110	Chromatic-Aberration Interpolation Circuit

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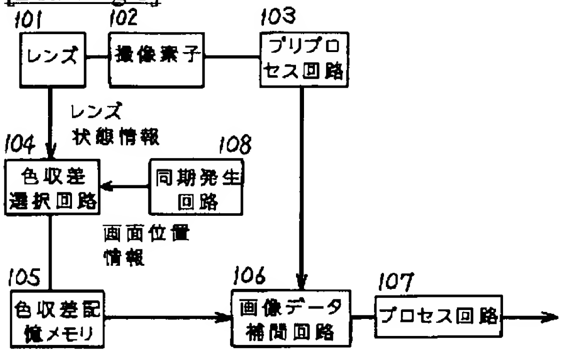
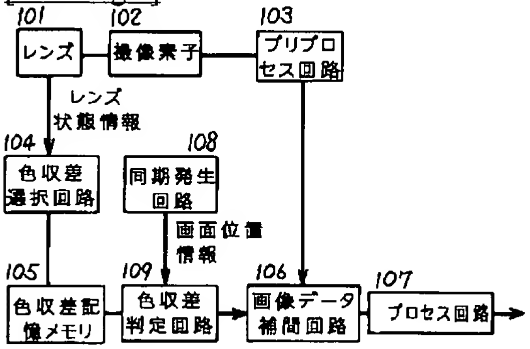
DRAWINGS

[Drawing 1]


101
102
103
レンズ
撮像素子
プリプロセス回路
レンズ状態情報
104
108
色収差選択回路
同期発生回路
画面位置情報
105
106
107
色収差記憶メモリ
画像データ補間回路
プロセス回路

[Drawing 2]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同期発生回路
画面位置情報
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109
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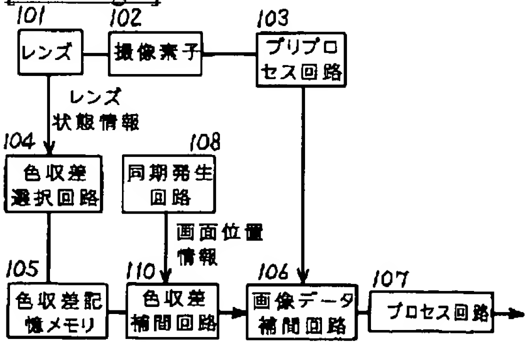
色収差判定回路
画像データ補間回路
プロセス回路

[Drawing 3]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レンズ状態情報
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色収差選択回路
同期発生回路
画面位置情報
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110
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107
色収差記憶メモリ
色収差補間回路
画像データ補間回路
プロセス回路

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